

Kapitel 1

Kursusgang 9 Dette afsnit vil behandle Kursusgang 9 i CART

1.1 Practice Problems

I denne sektion vil de givne Practice Problems for Kursusgangen blive gennemgået.

1.2 Practice Problem 6.5

Reads		Writes	
Sequential read throughput	550 MB/s	Sequential write throughput	470 MB/s
Random read throughput (IOPS)	89,000 IOPS	Random write throughput (IOPS)	74,000 IOPS
Random read throughput (MB/s)	365 MB/s	Random write throughput (MB/s)	303 MB/s
Avg. sequential read access time	50 μ s	Avg. sequential write access time	60 μ s

Figur 1.1: Performance characteristics of a commercial solid state disk. Source: Intel SSD 730 product specifications. IOPS is I/O per seconds. throughput numbers are based on reads and writes of 4 KB blocks. (Intel SSD 730 product specifications. Intel Cooperation)

As we have seen, a potential drawback of SSDs is that the underlying flash memory can wear out. For example, for the SSD in Figur 1.1, Intel guarantees about 128 petabytes ($128 \cdot 10^{15}$) of writes before the drive wears out. Given this assumption, estimate the lifetime (in years) of this SSD for the following workloads:

1. *Wors case for sequential writes:* The SSD is written to continuously at a rate of 470 MB/s (The average sequential write throughput of the device).
2. *Worst case for random writes:* The SSD is written to continuously at a rate of 303 MB/s (the average random write throughput of the device)
3. *Average case:* The SSD is written to at a rate of 20 GB/day (the average daily write rate assumed by some computer manufacturers in their mobile computer workload simulations)

1.2.1 Udregninger til 6.5

Det er givet at $1PB = 10^9 MB$. Samtidig vides det at der er 86400 sekunder på en dag.

1. Med denne information kan følgende formel bruges til at udregne levetiden for en SSD ved worst case load:

$$(10^9 \cdot 128) \cdot \left(\frac{1}{470}\right) \cdot \left(\frac{1}{(86400 \cdot 365)}\right) = \frac{800000}{92637} \approx 8.6359 \quad (1.1)$$

2. Samme formel kan bruges til at udregne worst case for random writes

$$(10^9 \cdot 128) \cdot \left(\frac{1}{303}\right) \cdot \left(\frac{1}{(86400 \cdot 365)}\right) = \frac{8000000}{597213} \approx 13.396 \quad (1.2)$$

3. Formlen kan også bruges til at udregne vores average case. Dog skal sekunder ikke bruges i dette tilfælde, da der arbejdes med en tidsfaktor af dage.

$$(10^9 \cdot 128) \cdot \left(\frac{1}{20000}\right) \cdot \left(\frac{1}{365}\right) = \frac{1280000}{73} \approx 17534.24658 \quad (1.3)$$

Udregningerne er i år.